

WHAT IS CLAIMED IS:

- 1 1. A method for making a thin film semi-conductor comprising
- 2 the steps of:
- 3 providing a semi-conductor substrate having a surface;
- 4 anodizing the semi-conductor substrate to provide a first porous layer
- 5 adjacent the surface having a first porosity;
- 6 anodizing the semi-conductor substrate to provide at least one second
- 7 porous layer adjacent the first porous layer opposite the surface, each said second
- 8 porous layer having a second porosity greater than said first porosity;
- 9 forming a semi-conductor film on the first porous layer; and
- 10 separating the semi-conductor film from the semi-conductor substrate
- 11 along a line of relative weakness defined in or adjacent one of said second porous
layers.

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1 2. ² A method for making a thin film semi-conductor comprising
2 the steps of:
3 providing a semi-conductor substrate having a surface;
4 anodizing the semi-conductor substrate at a first current density to
5 provide a first porous layer adjacent the surface having a first porosity;
6 anodizing the semi-conductor substrate at a second current density
7 higher than said first current density to provide a second porous layer adjacent the
8 first porous layer opposite the surface, the second porous layer having a second
9 porosity greater than the first porosity;
10 anodizing the semi-conductor substrate at a third current density higher
11 than said second current density to provide a third porous layer in or adjacent the
12 second porous layer, the third porous layer having a third porosity higher than said
13 second porosity;
14 forming at least one semi-conductor film on the surface and first
15 porous layer; and
16 separating the semi-conductor film from the semi-conductor substrate
17 along a line of relative weakness defined in the third porous layer or at or adjacent an
interface defined between said third porous layer and the second porous layer.

1 3. ³ A method as defined in Claim 2, wherein in said anodizing
2 steps, the semi-conductor substrate is contacted by an electrolytic solution and
3 exposed to a flow of current at said first, second and third current density,
respectively.

1 4. ⁴ A method as defined in Claim 3, wherein the electrolytic
solution comprises hydrogen fluoride and a hydrocarbon alcohol.

1 5. A method as defined in Claim 3, wherein in the anodizing
steps, the electrolytic solution is the same.

1 6. A method as defined in Claim 3, wherein the electrolytic
solution used in the anodizing steps varies.

1 16. A method as defined in Claim 13, wherein the support substrate
is attached to the semi-conductor film by adhesive bonding.

1 17. A method for making a solar cell comprising the steps of:
2 providing a semi-conductor substrate having a surface;
3 forming a porous structure adjacent the surface of the substrate
4 including a first porous layer adjacent the surface having a first porosity, a second
5 porous layer adjacent the first porous layer opposite the surface having a second
6 porosity greater than said first porosity and a third porous layer in or adjacent to the
7 second porous layer having a third porosity greater than said second porosity;
8 forming an epitaxially grown thin film semi-conductor structure on the
9 surface including at least one hetero junction;
10 forming a SiO₂ insulating layer on an exposed surface of the thin film
11 semi-conductor structure;
12 patterning and etching the insulating layer to define holes;
13 depositing a metal film on the insulating layer to form a metal film
14 layer;
15 patterning and etching the metal film layer to form electrodes disposed
16 in the holes;
17 attaching elongate conductors having at least one extending end
18 portion to the electrodes;
19 attaching a support substrate to the surface overlying the electrodes and
20 conductors with a binder material; and
21 thereafter, separating the thin film semi-conductor structure and
22 support substrate from the semi-conductor substrate along a line of relative weakness
23 defined in the third porous layer or at or adjacent an interface defined between said
third porous layer and the second porous layer.

1 18. A method for making a solar cell as defined in Claim 17,
2 wherein the epitaxially grown thin film semi-conductor structure comprises a p⁺/p⁻/n⁺
thin film semi-conductor structure.

1 19. A method for making a solar cell as defined in Claim 17 further
2 comprising the step of applying a metal electrode to a surface of the separated thin
film semi-conductor structure opposite the support substrate.

1 21. A method for making a solar cell as defined in Claim 17,
 wherein the support substrate is a flexible substrate.

1 22. A method for making a solar cell as defined in Claim 17,
 wherein the support substrate and binder are transparent.

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1 23. A method for making a light emitting diode, comprising the
2 steps of:
3 providing a single crystal semi-conductor substrate doped with a first
4 type of impurity having a surface;
5 introducing a second type of impurity into said surface to define a
6 surface layer doped with a second type of impurity adjacent the surface
7 anodizing the surface layer to define a first porous layer having a first
8 porosity along a surface of the surface layer;
9 anodizing the substrate to form a second porous layer adjacent the first
10 porosity layer and traversing the surface layer, and having a second porosity less than
11 said first porosity;
12 anodizing the substrate to form a third porous layer in the second
13 porous layer, the third porous layer having a third porosity greater than the second
14 porosity;
15 providing a plurality of parallel spaced electrodes on said first porous
16 layer;
17 attaching a transparent support substrate to the surface and electrodes
18 with a transparent binder material;
19 separating the second porous layer from the semi-conductor substrate
20 along a line of weakness defined in the third porous layer or at or adjacent and
21 interface defined between said second porous layer and the third porous layer to form
22 a separated LED substrate;
23 providing a like second plurality of parallel spaced electrodes on an
24 exposed surface of said second porous layer opposite the surface layer;
25 attaching a second transparent support substrate to the exposed surface
26 and electrodes with a transparent binder material to form an LED assembly; and
27 thereafter, subdividing the LED assembly between the spaced
electrodes to define a plurality of LED devices.

- 1 24. A method as defined in Claim 23, wherein the semi-conductor
substrate comprises a p-type impurity.
- 1 25. A method as defined in Claim 24, wherein the surface layer
comprises an n-type impurity.

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add C'

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